

Request For Action		RFA Number: #1
RFA Date:	December 15, 2003	
Project:	GLAST	
System:	GLAST Mission Operations Center (MOC)	
Review:	Design Peer Review	
Review Date:	December 15, 2003	
Originator:	David Tracewell	
Discrepancy/ Problem:	Is the variable s/c area (due to attitude maneuvers of s/c during science operations) a significant source of error in the 7-9 day predicted ephemeris used for TDRSS contact scheduling? May not be issue when in survey mode (nominal attitude profile in survey mode is one rev/orbit [1 RPO]).	
Recommended Action:	Access impact on predicted ephemeris accuracy due to s/c area changes during prediction period (9 days). Evaluate if using the predicted attitude file used for attitude dependent TDRSS predictions could be used in STK predicted ephemeris generation and determine if it is necessary.	
Assignee:	Jonathan DeGumbia	

RFA Response:

The impact of spacecraft attitude on orbit propagation over the expected planning period will be determined experimentally using the Satellite Tool Kit software suite. A series of scenarios will be used to propagate orbits from an identical initial state to determine the spacecraft positions after a 9-day period. The effect of a varying spacecraft attitude will be simulated by altering the area/mass ratio of the simulated satellite. The solar pressure and atmospheric drag force models of STK’s HPOP propagator will be manipulated to isolate their effects on orbit propagation. After all the scenarios have been propagated, position reports from each will be compared. Positional differences will be assessed to determine if the simulated attitude changes pose significant impacts on propagation accuracy. If it is determined that the impacts are significant, the projected attitude of the observatory will be used to propagate the orbit during on-orbit operations.

To simulate best and worse case scenarios, the area of the area/mass ratios of the simulated satellite will be varied between maximum and minimum values. The maximum area will be the sum of the cross sectional area of the bus including the LAT instrument and the two solar panels. The minimum area will be the cross section area of just the bus and the LAT.

The following 5 scenarios will serve as the initial basis for comparison. All scenarios will initiate at the projected end-of-life altitude.

Atmospheric Drag	Solar Pressure	Area/Mass Ratio	Comment
Off	Off	n/a	Baseline
On	Off	Maximum	Maximum Atmospheric Drag
On	Off	Minimum	Minimum Atmospheric Drag
Off	On	Maximum when retreating from the sun, minimum when advancing towards it	Maximum orbit advancing force due to solar pressure
Off	On	Minimum when retreating from the sun, maximum when advancing towards it	Maximum orbit retarding force due to solar pressure

Status:	<p>Date: Thu, 05 Feb 2004 15:52:36 -0500 To: Cynthia Adams <cynthia.k.adams@nasa.gov> From: david tracewell <david.a.tracewell@nasa.gov> Subject: Re: Fwd: GLAST MOC Design Review</p> <p>Cindi, I reviewed the RFA response and it looks like a comprehensive analysis has been suggested. I have two comments regarding the response and left a phonemail for Jonathan DeGumbia describing them. Otherwise, I concur with the RFA response.</p> <p>1) Quantify "significant impact" in the RFA response. The goal is to provide accurate (I don't recall the time requirement) contact predicts 9 days in the future. Please include this time requirement.</p> <p>2) Possibly add a "nominal attitude" case with: Atmospheric drag = on Solar pressure = on Area/Mass Ratio = average s/c area during 1 revolution/orbit attitude mode Comment = nominal attitude profile This nominal attitude case could be used as the "baseline" for comparison with the other attitude profiles. Please pass this email on to Jonathan; he doesn't show up in the Eudora directory.</p> <hr/> <p>2/27/04 Awaiting additional information from Jonathan DeGumbia concerning the nominal case and the RFA should be closed</p>
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Request For Action		RFA Number: #2
RFA Date:	December 15, 2003	
Project:	GLAST	
System:	GLAST Mission Operations Center (MOC)	
Review:	Design Peer Review	
Review Date:	December 15, 2003	
Originator:	Steve Tompkins	
Discrepancy/ Problem:	It is not clear that the scheduling timeline for the WCC is consistent with the timeline for receiving the schedule from the GSSC.	
Recommended Action:	By the next review, provide a more detailed timeline of how the science planning, mission planning, and TDRSS planning will fit together.	
Assignee:	Jonathan DeGumbia	
RFA Response:	<p>The day after the MOC Peer Review there was an Ops TIM. With representatives of the MOC, LIOC, GIOC, GSSC, and Spectrum Astro present, we began a discussion on the scheduling timeline. Over the next couple of weeks, a consensus was reached on a scheduling concept. The concept was captured in a series of PowerPoint slides. On January 22nd, a meeting was held between the ground system development team and SN representatives where the scheduling concept was presented and discussed. We are currently in the processes of tweaking the scheduling concept to comply with the TRDSS scheduling constraints. Meetings will continue with all involved parties to ensure a working concept by the next review. We will continue to update the PowerPoint slides to match the concept as it evolves. The slides will be presented it the next peer review.</p> <p>Scheduling concept slides are available for review upon request.</p>	

Status:	Scheduling concept slides were provided in powerpoint which was provided to the originator to review.
	Date: Fri, 20 Feb 2004 08:21:34 -0500 To: Cynthia Adams <cynthia.k.adams@nasa.gov> From: Steve Tompkins <steve.tompkins@nasa.gov> Subject: Re: GLAST MOC Design Review RFA Status Needed ASAP Cindi - the response to RFA #2 was fine. Steve
	2/27/04 RFA Closed

Request For Action		RFA Number: #3
RFA Date:	December 15, 2003	
Project:	GLAST	
System:	GLAST Mission Operations Center (MOC)	
Review:	Design Peer Review	
Review Date:	December 15, 2003	
Originator:	Dan Mandl	
Discrepancy/ Problem:	Clarification of where MOC to Flight Software Interface is documented.	
Recommended Action:	It was not clear where the interface for Flight Software loads and Flight Software Images is documented. Identify where this requirement information will reside.	
Assignee:	Doug Spiegel	
RFA Response:	The MOC-FSW interface will be added to the Operations Data Products ICD. The next revision of the ICD is planned for May'04, and the final is due GSDR + 2 months.	
Status:	2/27/04 No status provided from originator. Assume to be in agreement and recommend closure of RFA.	

Request For Action		RFA Number: #4
RFA Date:	December 15, 2003	
Project:	GLAST	
System:	GLAST Mission Operations Center (MOC)	
Review:	Design Peer Review	
Review Date:	December 15, 2003	
Originator:	Dan Mandl	
Discrepancy/ Problem:	No mention of process to handle contingency procedures and constraints.	
Recommended Action:	Begin developing process and buckets for handling contingencies and constraints. Present a slide or 2 at CDR on planned approach. It should include anticipated manpower needed from both FOT and other project personnel such as subsystem engineers.	
Assignee:	Jonathan DeGumbia	
RFA Response:	<p>Contingencies: Spacecraft contingency procedures will be delivered by Spectrum. These procedures will be translated (if necessary) into contingency scripts to be used by the FOT. For ground system and operational contingencies, scenarios will be identified. FOT will create procedures/scripts for each.</p> <p>Each procedure/script will be simulated/tested and peer reviewed. Procedures/scripts will be CM controlled.</p> <p>Constraints: Find out what kind of constraints we are talking about. Command constraints?</p>	
Status:	2/27/04 No status provided from originator. Assume to be in agreement and recommend closure of RFA.	

Request For Action		RFA Number: #5
RFA Date:	December 15, 2003	
Project:	GLAST	
System:	GLAST Mission Operations Center (MOC)	
Review:	Design Peer Review	
Review Date:	December 15, 2003	
Originator:	Mike Rackley	
Discrepancy/ Problem:	Unclear what the requirements are for how fast the MOC must be able to process offline data (for later use in trending), or must access archived raw data. Also unclear why MOC requirement T&A0140, which states the actual trend plotting, must be at a rate at least 30x real-time refers to the 1 hz rate in the comment.	
Recommended Action:	Clarify, analyze and document the appropriate offline processing requirements.	
Assignee:	Jonathan DeGumbia	
RFA Response:	<ul style="list-style-type: none"> • Comment in T&A0140 should not exist. It has been deleted. • Added Requirement T&A0053: The MOC shall provide the capability to populate the MOC Trending System with data from archived raw frame files. • Added Requirement T&A0057: The MOC Trending System shall be capable of storing a subset of observatory HK and ground station data. • Added Requirement T&A0075: The MOC shall make post-pass HK data available for trending within 1 hour (TBD) of receiving the data. • Added Requirement T&A0083: The MOC Trending System shall retain trending data for the past 60 (TBD) days. • Added Requirement T&A0084: The MOC Trending System shall retain statistical trending data for life of mission. <i>Comment:</i> Statistical trending data to include min, max, mean, and standard deviation. • Added Requirement T&A0085: The MOC shall provide the capability to re-populate the MOC Trending System with previously deleted data from the archived raw frame files. • Added Requirement T&A0087: The MOC shall provide the capability to re-populate the MOC Trending System with 1-day of HK data within 4 hours of receiving a request. <i>Comment:</i> Applicable only when the MOC is staffed. 	
Status:	2/27/04 No status provided from originator. Assume to be in agreement and recommend closure of RFA.	

Request For Action		RFA Number: #6
RFA Date:	December 15, 2003	
Project:	GLAST	
System:	GLAST Mission Operations Center (MOC)	
Review:	Design Peer Review	
Review Date:	December 15, 2003	
Originator:	Pat Crouse	
Discrepancy/ Problem:	Notification to SN that GLAST has executed an Autonomous Repoint (AR) and has impacted scheduled passes.	
Recommended Action:	Determine what process will be followed to notify the SN of a deviation from the operational schedule. Make sure approach is consistent with operations concept.	
Assignee:	John Nagy	
RFA Response:	<p>A Space Network Operations meeting was held on 1/22/04 between the FOT, Leslie Ambrose (SN), and Riley Elwood (SN):</p> <p>When the Space Network detects no RF during a scheduled support a problem report is immediately opened. The GLAST mission will need to notify the Space Network via email or phone as to the reason for the missed contact. It was agreed that this could be done as soon the FOT returns to work during normal business hours and did not have to be an automated system or take place during the night or weekends.</p>	

Status:	<p>Date: Thu, 19 Feb 2004 09:06:23 -0500 To: Cynthia Adams <cynthia.k.adams@nasa.gov> From: Patrick Crouse <patrick.crouse@gsfc.nasa.gov> Subject: Re: GLAST MOC Design Review RFA Status Needed ASAP</p> <p>Cindi,</p> <p>I sent my responses back to Doug Spiegel the other week. I concurred with the responses and recommend closure.</p> <hr/> <p>2/27/04 RFA Closed</p>
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Request For Action		RFA Number: #7
RFA Date:	December 15, 2003	
Project:	GLAST	
System:	GLAST Mission Operations Center (MOC)	
Review:	Design Peer Review	
Review Date:	December 15, 2003	
Originator:	Steve Colye	
Discrepancy/ Problem:	Implement a TDRS interface at Spectrum.	
Recommended Action:	Install a roof-top antenna at Spectrum. Similar to what was done on GRO at Space Park.	
Assignee:	Doug Spiegel	
RFA Response:	<p>Since all Observatory I&T will be done at Spectrum Astro's facility in Gilbert, AZ, the program would benefit from the ability to perform testing of the spacecraft with the SN/TDRSS. This would require Spectrum to install an antenna at their I&T facility to communicate with TDRSS. This would allow the MOC to conduct tests in an end-to-end manner with the spacecraft while in the I&T facility, and alleviate the need for the CTV, a limited resource. Providing the capability to perform end-to-end testing without dependencies on other assets is a risk-reduction activity that has proven beneficial on other programs.</p> <p>This RFA needs to be re-assigned to the GLAST Project for assessment.</p>	
Status:	<p>Date: Wed, 18 Feb 2004 21:27:40 -0500 Subject: Re: GLAST MOC Design Review RFA Status Needed ASAP From: "Steven E. Coyle" <Steven.E.Coyle@nasa.gov> To: Cynthia Adams <cynthia.k.adams@nasa.gov></p> <p>Cynthia,</p> <p>I told Doug that I was okay with the response to #7. I thought he pass it on to you.</p>	
	2/27/04 RFA Closed	

Request For Action		RFA Number: #8
RFA Date:	December 15, 2003	
Project:	GLAST	
System:	GLAST Mission Operations Center (MOC)	
Review:	Design Peer Review	
Review Date:	December 15, 2003	
Originator:	Tim Rykowski	
Discrepancy/ Problem:	It's not clear that the DAS approach (any) adopted by the Project is consistent with OPS concept for uplinking schedules. DAS schedules only cover 96 hours in duration.	
Recommended Action:	Consider DAS "ALL" services, or negotiate with SN to modify "Any" service to provide at least 7 days of definitive schedules. Need decision by GS SDR.	
Assignee:	John Nagy	

<p>RFA Response:</p>	<p>A Space Network Operations meeting was held on 1/22/04 between the FOT, Leslie Ambrose (SN), and Riley Elwood (SN):</p> <p>The DAS “Any” scheduling software is set to generate schedules for all users covering up to 96 hours. 96 hours of TDRSS scheduling would necessitate more frequent scheduling and uploading to GLAST and not fit within the current once-a-week ATS upload plan. It doesn’t appear the scheduling software would be modified to accommodate longer periods for GLAST.</p> <p>A GLAST operations concept for how to utilize the DAS “All” mode of operations was formulated prior to the meeting and discussed with the SN representatives. The DAS “All” approach does seem to satisfy the GLAST needs. This operations concept will be further analyzed to make sure it meets all GLAST requirements.</p> <p>Concept for Operating with the DAS “All”</p> <p>The MOC would use the GLAST orbital vector and the DAS capable TDRSS orbital vectors to produce an access file using STK. The access file would be created in the same manner the DAS “Any” and the handovers would be calculated at the midpoint between overlapping TDRSS views. The TDRSS to GLAST accesses could be calculated for at least a week.</p> <p>This access file would be used by two systems, spacecraft and ground. The accesses would be integrated in the weekly absolute time sequence to instruct the GLAST spacecraft which TDRSS to transmit burst alerts or alert telemetry throughout the orbit. The file would also be used to control the DAS AMAC (Automation Monitoring and Control) software to control the ITOS system. The ITOS system would listen to the port that the spacecraft is transmitting to throughout the day. Since they use the same schedule when the spacecraft switches to a new TDRSS in orbit the ground system would also switch to a new active port. This avoids the complexity of having to choose which TDRSS has a better signal. The MOC access file always has the spacecraft transmitting to the closest TDRSS it should also have the best possible chance of receiving the telemetry.</p>
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Status:	<p>Date: Thu, 19 Feb 2004 08:33:35 -0500 To: Cynthia Adams <cynthia.k.adams@nasa.gov> From: Tim Rykowski <Timothy.B.Rykowski@nasa.gov> Subject: Re: GLAST MOC Design Review RFA Status Needed ASAP</p> <p>Cindy,</p> <p>Sorry I forgot to get back to you earlier. I concur with the responses prepared for the two RFA's I submitted, so I have no issues and recommend closure.</p> <hr/> <p>2/27/04 RFA Closed</p>
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Request For Action		RFA Number: #9
RFA Date:	December 15, 2003	
Project:	GLAST	
System:	GLAST Mission Operations Center (MOC)	
Review:	Design Peer Review	
Review Date:	December 15, 2003	
Originator:	Tim Rykowski	
Discrepancy/ Problem:	ITOS Compliance with 2810.1 security regulations -> not clear that current version supports <u>All</u> mission level security regulations. In A.6 of document.	
Recommended Action:	<u>By GS SDR:</u> <ol style="list-style-type: none"> 1. Determine which security requirements require ITOS development support based on current assessment of ITOS functionality 2. Work agreement with ITOS folks to establish schedule 3. Submit waivers as needed for those requirement beyond project budget baseline 	
Assignee:	Dustin Aldridge	

RFA Response:	<p>The primary concern with complying with NPG 2810.1 security regulations is the “no group accounts/passwords” requirement in the section A.6 of the document. With past missions, a waiver was submitted and approved so that group accounts and passwords could be used. The primary reason for needing this waiver is the ground system runs for days at a time having been started by one user and run by several users. Under this scenario, a common group user is the best technical solution. We have spoken with the ITOS developers, who have indicated that some projects are using smart screensavers to restrict and log user transitions. This may conform to the intent of NPG 2810.1. We are considering this as a less costly solution than redesigning all of our MOC software (including ITOS) to have the capability to transition user process ownership.</p> <p>In addition, the ITOS team has indicated that there is a GSFC wide team that is reviewing solutions for these common security problems.</p> <p>Our roadmap for conforming to this security requirement is to continue to be engaged in these technical discussions and agree on one or several identified solutions by GS SDR.</p>
Status:	<p>Date: Thu, 19 Feb 2004 08:33:35 -0500 To: Cynthia Adams <cynthia.k.adams@nasa.gov> From: Tim Rykowski <Timothy.B.Rykowski@nasa.gov> Subject: Re: GLAST MOC Design Review RFA Status Needed ASAP</p> <p>Cindy,</p> <p>Sorry I forgot to get back to you earlier. I concur with the responses prepared for the two RFA's I submitted, so I have no issues and recommend closure.</p> <hr/> <p>2/27/04 RFA Closed</p>

Request For Action		RFA Number: #10
RFA Date:	December 15, 2003	
Project:	GLAST	
System:	GLAST Mission Operations Center (MOC)	
Review:	Design Peer Review	
Review Date:	December 15, 2003	
Originator:	Pat Crouse	
Discrepancy/ Problem:	Not clear what the concept is to ensure spacecraft knows how and where to point Ku antenna to acquire TDRSS. What is the form of TDRSS ephemeris knowledge needed by spacecraft?	
Recommended Action:	Document what and how TDRSS position is made available to GLAST. Validate accuracy and margin to point antenna and meet minimum contact time requirements. Factor in planning time for proper accuracy.	
Assignee:	Jonathan DeGumbia	
RFA Response:	<p>Spectrum Astro has confirmed that the observatory will have an on-board propagator that will propagate the orbits of the TDRS satellites. Orbit parameters will have to be updated by the MOC on a regular basis (approximately once per month.) The on-board propagator will create an on-board ephemeris that will provide the observatory with Ku-band antenna pointing information. This will allow the observatory to account for each TDRSS figure-8 ground-track pattern resulting from an imperfect geostationary orbit to point the Ku-band antenna within the 1 deg. half coning angle field-of-view.</p> <p>Need to have meeting with TDRSS scheduling people to determine how the MOC will receive TDRSS ephemeris data, how accurate it is, and how often it gets updated.</p>	

Status:	<p>Date: Thu, 19 Feb 2004 09:06:23 -0500 To: Cynthia Adams <cynthia.k.adams@nasa.gov> From: Patrick Crouse <patrick.crouse@gsfc.nasa.gov> Subject: Re: GLAST MOC Design Review RFA Status Needed ASAP</p> <p>Cindi,</p> <p>I sent my responses back to Doug Spiegel the other week. I concurred with the responses and recommend closure.</p> <hr/> <p>2/27/04 RFA Closed</p>
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